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Perman & Green, LLP 99 Hawley Lane Stratford, CT 06614			BALL, JOHN C	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/559,958	Applicant(s) MANZ ET AL.	
	Examiner J. CHRISTOPHER BALL	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 January 1999.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-99 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-99 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 December 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Summary

1. This is the initial Office Action based on the MANZ et al. application filed under the Patent Cooperation Treaty on June 8, 2004, now before the Office as a National Stage application.
2. Claims 1-99 are currently pending and have been fully considered.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.
4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:
 1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Art Unit: 1795

5. Claims 1-99 are rejected under 35 U.S.C. 103(a) as being unpatentable over an article by RAYMOND et al. ("Continuous Sample Pretreatment Using a Free-Flow Electrophoresis Device Integrated onto a Silicon Chip", ANALYTICAL CHEMISTRY, vol. 66, September 15, 1994, p. 2858-2865) in view of OAKLEY et al. (US 2003/0159999 A1).

Regarding claim 1, RAYMOND teaches a free flow electrophoresis microchip, comprising:

a separation chamber in which charged components are in use separated (separation bed, Figure 3);

a plurality of separation medium inlet channels having outlets fluidly connected to one inlet side of the separation chamber (1 and 2, Figure 2; left carrier inlet and right carrier inlet, Figure 3) through which flows of a separation medium are in use introduced into the separation chamber such as to develop a laminar flow (second paragraph, Silicon Device section, p. 2860) having a flow direction through the separation chamber (carrier flow indication, Figure 1);

a sample inlet channel having an outlet fluidly connected to the inlet side of the separation chamber (3, Figure 2; sample inlet, Figure 3) through which a flow of sample containing charged components is in use introduced into the separation chamber (first paragraph, Amino Acid Separation section, p. 2863; Figure 1); and

whereby charged components introduced into the separation chamber are deflected laterally across the separation chamber in dependence upon the charge of the charged components (Figure 1).

RAYMOND suggests a plurality of outlet channels having inlets fluidly connected to another outlet side of the separation chamber opposite the inlet side thereof (second paragraph, Silicon Device section, p. 2860), although this design was not utilized in the described invention to simplify fabrication of the initial device.

RAYMOND does not teach a magnetic field unit.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058]).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

Regarding claim 2, RAYMOND teaches outlets of the separation medium inlet channels are disposed in a spaced relation along the inlet side of the separation chamber (Figure 3).

Regarding claim 3, RAYMOND teaches the outlet of the sample inlet channel is disposed in a central region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 4, RAYMOND teaches the outlet of the sample inlet channel is disposed in an end region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 5, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels face in the same direction (Figures 2 and 3).

Regarding claim 6, RAYMOND teaches the separation medium inlet channels are commonly fluidly connected (Figure 2).

Regarding claim 7, RAYMOND teaches groups of ones of the separation medium inlet channels are commonly fluidly connected (Figure 3).

Regarding claim 8, RAYMOND teaches the separation medium inlet channels are separately fluidly connected (Figure 3).

Regarding claim 9, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels are disposed in opposed relation to the inlets of the outlet channels (Figure 2).

Regarding claim 10, RAYMOND suggests the inlets of the outlet channels have a depth at least as great as that of the separation chamber, in that the proposed outlet array is identical to the inlet channel array (second paragraph, Silicon Devices section, p. 2860) and the inlet channel array is shown to have a depth at least as great as that of the separation chamber (Figure 3).

Regarding claim 11, RAYMOND teaches the inlets of the outlet channels are disposed in a spaced relation along the outlet side of the separation chamber (Figure 2).

Regarding claim 12, RAYMOND teaches the inlets of the outlet channels are equally spaced (Figure 2).

Regarding claim 13, RAYMOND teaches the separation chamber comprises a planar chamber (Figure 3) having a planar region (separation bed, Figure 3).

Regarding claim 14, RAYMOND does not teach a magnetic field.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058], wherein the magnetic field is directed substantially orthogonally to a planar region of a microchannel (44 and 92, Figure 3).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

Regarding claim 15, RAYMOND teaches the separation chamber has a depth of 50 μm (first paragraph, Silicon Devices section, p. 2859).

Regarding claims 16-18, RAYMOND, as modified by OAKLEY in claim 1, teaches a magnetic field unit that is a field generator (OAKLEY, paragraph [0058]). Neither RAYMOND nor OAKLEY teach the magnetic field unit is a magnet in the form of a Ni-Fe permalloy magnet, which is a well-known magnetic material.

However, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element in the field generator, as taught by OAKLEY, as the magnetic field unit for another known

Art Unit: 1795

element, a Ni-Fe permalloy magnet, with a predictable result (*KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, 82 USPQ2d 1385 (2007)).

Regarding claim 19, RAYMOND teaches the microchip further comprising:
a first and second electrode unit (third paragraph, Silicon Devices section, p. 2860) disposed at respective ones of other lateral sides of the separation chamber (8 and 9, Figure 2).

Regarding claim 20, RAYMOND teaches the electrode units each comprise an electrolyte reservoir disposed adjacent the respective lateral side of the separation chamber (8 and 9, Figure 2; side beds, Figure 3) for containing a volume of an electrolyte medium, by virtue of having their own inlets (4 and 5, Figure 2) and outlets (6 and 7, Figure 2), and a plurality of connection channels fluidly connecting the electrolyte reservoir to the respective lateral side of the separation channel (side channel arrays, Figure 3).

Regarding claim 21, RAYMOND teaches each electrolyte reservoir has substantially the same length as the separation chamber (Figure 2).

Regarding claim 22, RAYMOND teaches the connection channels are disposed in a spaced relation along the respective lateral sides of the separation channel (Figure 3).

Regarding claim 23, RAYMOND teaches the connection channels are equally spaced (Figure 3).

Regarding claim 24, RAYMOND teaches the connection channels are 12 μm wide (first paragraph, Silicon Devices section, p. 2859-2860). RAYMOND does not explicitly teach the connection channels have a width from about 1 μm to about 5 μm . However, it has been held where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (*Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)). Therefore, it would be obvious to one of skill in the art, given the width taught by RAYMOND to utilize a width in the range from about 1 μm to about 5 μm as it is merely a simple change in dimension that would not perform a different function as the width explicitly taught by RAYMOND.

Regarding claim 25, RAYMOND teaches the electrode unit each further comprises an electrode element disposed in the respective electrolyte reservoir (third paragraph, Silicon Devices section, p. 2860).

Art Unit: 1795

Regarding claim 26, RAYMOND, as modified by OAKLEY, teaches all the limitations of claims 1 and 19 for a free flow electrophoresis microchip, as outlined above. Additionally, RAYMOND teaches a high-voltage supply for applying an electric field between the electrode units and across the separation chamber (last two sentences, Equipment and Data Acquisition section, p. 2860) in a direction that would substantially orthogonal to the magnetic field as taught by OAKLEY (RAYMOND, Figure 1). The combination of the electric field and magnetic field would inherently yield a magnetohydrodynamic flow of sample and separation medium in the separation chamber.

Regarding claim 27, RAYMOND, as modified by OAKLEY, teaches all the limitations of claims 1 and 19 for a free flow electrophoresis microchip, as outlined above. Additionally, RAYMOND teaches a supply unit for supplying flows of sample and separation medium through the respective ones of the sample inlet channel and the separation medium inlet channels and into the separation chamber (fifth sentence, Equipment and Data Acquisition section, p. 2860); whereby an electric field is induced across the separation chamber in a direction substantially orthogonal to the flow direction (Figure 1).

Regarding claim 28, RAYMOND teaches the supply unit comprises a first transfer unit, in the form of external fluid lines (second paragraph, Silicon Devices section, p. 2860) and syringe pumps (Equipment and Data Acquisition section, p.

Art Unit: 1795

2860), connected to the sample inlet channel for delivering a flow of sample through the sample inlet channel and into the separation chamber (as demonstrated in a measurable sample flow rate, Figure 6 caption), and at least one second transfer unit, in the form of external fluid lines (second paragraph, Silicon Devices section, p. 2860) and syringe pumps (Equipment and Data Acquisition section, p. 2860), fluidly connected to the separation medium inlet channels for delivering flows of separation medium through the separation medium inlet channels and into the separation chamber (as demonstrated in a measurable carrier buffer flow rate, Figure 6 caption).

Regarding claim 29, RAYMOND teaches both the first and second transfer units are operable to control flow rate of the sample and separation medium flows to the separation chamber (Figure 6 caption).

Regarding claim 30, RAYMOND does not explicitly teach the at least one second transfer unit comprises a plurality of second transfer units fluidly connected to respective ones of the separation medium inlet channels. However, RAYMOND teaches that the second transfer unit is fluidly connected to at least one of the separation medium inlet channels (as demonstrated in a measurable carrier buffer flow rate, Figure 6 caption), and it has been held that mere duplication of parts has no patentable significance unless a new and

Art Unit: 1795

unexpected result is produced (*In re Harza*, 274 F.2d 669, 124 USPQ 378 (CCPA 1960)).

Regarding claims 31 and 32, the teachings of RAYMOND and holdings of precedent make the limitations of claim 30 obvious. It would be obvious to one of ordinary skill in the art that the plurality of second transfer units, in the form of external fluid lines (second paragraph, Silicon Devices section, p. 2860) and syringe pumps (Equipment and Data Acquisition section, p. 2860), could either be fluidly connected to groups of ones of the separation medium inlet channels or fluidly connected to separate ones of the separation medium inlet channels as a matter of design choice that would not impact the overall performance of the described device.

Regarding claim 33, RAYMOND teaches each transfer unit comprises a delivery pump, in the form of syringe pumps (Equipment and Data Acquisition section, p. 2860).

Regarding claims 34 and 35, RAYMOND suggested a plurality of collection units fluidly connected to respective ones of the outlet channels for collection of a plurality of separated components, suggesting a fraction collector (second paragraph, Silicon Devices section, p. 2860).

Art Unit: 1795

Regarding claim 36, RAYMOND teaches a detection unit (Detection System section, p. 2860) for detecting migration of at least one separated component through at least one of the outlet channels (inset Figure 8 and Figure 9).

Regarding claims 37 and 38, RAYMOND teaches that the detection system comprises a motorized X-Y translation stage that allows scanning across the separation bed width, at various locations along its length (Equipment and Data Acquisition section, p. 2860). This, coupled with the suggestion of RAYMOND for a fraction collector (second paragraph, Silicon Devices section, p. 2860) would have made it obvious to a skilled artisan to utilize the detection unit to detect migration of separated components through any or all of the outlet channels because ideally the separated components will reside in a particular outlet channel of the fraction collector.

Regarding claim 39, RAYMOND teaches a free flow electrophoresis method of separating charged components, the method comprising the steps of:

providing a free flow electrophoresis microchip, comprising:

a separation chamber in which charged components are in use separated (separation bed, Figure 3);

a plurality of separation medium inlet channels having outlets fluidly connected to one inlet side of the separation chamber (1 and 2, Figure 2; left

Art Unit: 1795

carrier inlet and right carrier inlet, Figure 3) through which flows of a separation medium are in use introduced into the separation chamber such as to develop a laminar flow (second paragraph, Silicon Device section, p. 2860) having a flow direction through the separation chamber (carrier flow indication, Figure 1);

a sample inlet channel having an outlet fluidly connected to the inlet side of the separation chamber (3, Figure 2; sample inlet, Figure 3) through which a flow of sample containing charged components is in use introduced into the separation chamber (first paragraph, Amino Acid Separation section, p. 2863; Figure 1); a first and second electrode units (third paragraph, Silicon Devices section, p. 2860) disposed at respective ones of other lateral sides of the separation chamber (8 and 9, Figure 2).

RAYMOND suggests a plurality of outlet channels having inlets fluidly connected to another outlet side of the separation chamber opposite the inlet side thereof (second paragraph, Silicon Device section, p. 2860), although this design was not utilized in the described invention to simplify fabrication of the initial device.

RAYMOND does not teach a magnetic field unit.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058]).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

RAYMOND also teaches applying a potential between the electrode units so as to generate an electric field across the separation chamber in a direction that would be substantially orthogonal to the magnetic field as taught by OAKLEY (Figure 1). The combination of the electric field and magnetic field would inherently yield a magnetohydrodynamic flow of sample and separation medium in the separation chamber, and RAYMOND teaches defection of the charged components laterally across the separation chamber in dependence upon the charge of the charged components (Figure 1).

Regarding claim 40, RAYMOND teaches outlets of the separation medium inlet channels are disposed in a spaced relation along the inlet side of the separation chamber (Figure 3).

Regarding claim 41, RAYMOND teaches the outlet of the sample inlet channel is disposed in a central region of the inlet side of the separation chamber (Figures 2 and 3).

Art Unit: 1795

Regarding claim 42, RAYMOND teaches the outlet of the sample inlet channel is disposed in an end region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 43, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels face in the same direction (Figures 2 and 3).

Regarding claim 44, RAYMOND teaches the separation medium inlet channels are commonly fluidly connected (Figure 2).

Regarding claim 45, RAYMOND teaches groups of ones of the separation medium inlet channels are commonly fluidly connected (Figure 3).

Regarding claim 46, RAYMOND teaches the separation medium inlet channels are separately fluidly connected (Figure 3).

Regarding claim 47, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels are disposed in opposed relation to the inlets of the outlet channels (Figure 2).

Regarding claim 48, RAYMOND suggests the inlets of the outlet channels have a depth at least as great as that of the separation chamber, in that the

Art Unit: 1795

proposed outlet array is identical to the inlet channel array (second paragraph, Silicon Devices section, p. 2860) and the inlet channel array is shown to have a depth at least as great as that of the separation chamber (Figure 3).

Regarding claim 49, RAYMOND teaches the inlets of the outlet channels are disposed in a spaced relation along the outlet side of the separation chamber (Figure 2).

Regarding claim 50, RAYMOND teaches the inlets of the outlet channels are equally spaced (Figure 2).

Regarding claim 51, RAYMOND teaches the separation chamber comprises a planar chamber (Figure 3) having a planar region (separation bed, Figure 3).

Regarding claim 52, RAYMOND does not teach a magnetic field.

However, OAKLEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058], wherein the magnetic field is directed substantially orthogonally to a planar region of a microchannel (44 and 92, Figure 3).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the

Art Unit: 1795

addition of the magnetic field unit as taught by OAKLEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKLEY, paragraph [0047]).

Regarding claim 53, RAYMOND teaches the separation chamber has a depth of 50 μm (first paragraph, Silicon Devices section, p. 2859).

Regarding claims 54-56, RAYMOND, as modified by OAKLEY in claim 1, teaches a magnetic field unit that is a field generator (OAKLEY, paragraph [0058]). Neither RAYMOND nor OAKLEY teach the magnetic field unit is a magnet in the form of a Ni-Fe permalloy magnet, which is a well-known magnetic material.

However, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element in the field generator, as taught by OAKLEY, as the magnetic field unit for another known element, a Ni-Fe permalloy magnet, with a predictable result (*KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, 82 USPQ2d 1385 (2007)).

Regarding claim 57, RAYMOND teaches the electrode units each comprise an electrolyte reservoir disposed adjacent the respective lateral side of the separation chamber (8 and 9, Figure 2; side beds, Figure 3) for containing a volume of an electrolyte medium, by virtue of having their own inlets (4 and 5,

Art Unit: 1795

Figure 2) and outlets (6 and 7, Figure 2), and a plurality of connection channels fluidly connecting the electrolyte reservoir to the respective lateral side of the separation channel (side channel arrays, Figure 3).

Regarding claim 58, RAYMOND teaches each electrolyte reservoir has substantially the same length as the separation chamber (Figure 2).

Regarding claim 59, RAYMOND teaches the connection channels are disposed in a spaced relation along the respective lateral sides of the separation channel (Figure 3).

Regarding claim 60, RAYMOND teaches the connection channels are equally spaced (Figure 3).

Regarding claim 61, RAYMOND teaches the connection channels are 12 μm wide (first paragraph, Silicon Devices section, p. 2859-2860). RAYMOND does not explicitly teach the connection channels have a width from about 1 μm to about 5 μm . However, it has been held where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (*Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220

Art Unit: 1795

USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)).

Therefore, it would be obvious to one of skill in the art, given the width taught by RAYMOND to utilize a width in the range from about 1 μm to about 5 μm as it is merely a simple change in dimension that would not perform a different function as the width explicitly taught by RAYMOND.

Regarding claim 62, RAYMOND teaches the electrode unit each further comprises an electrode element disposed in the respective electrolyte reservoir (third paragraph, Silicon Devices section, p. 2860).

Regarding claims 63 and 64, RAYMOND suggested a plurality of collection units fluidly connected to respective ones of the outlet channels for collection of a plurality of separated components, suggesting a fraction collector (second paragraph, Silicon Devices section, p. 2860).

Regarding claim 65, RAYMOND teaches a detection unit (Detection System section, p. 2860) for detecting migration of at least one separated component through at least one of the outlet channels (inset Figure 8 and Figure 9).

Regarding claims 66 and 67, RAYMOND teaches that the detection system comprises a motorized X-Y translation stage that allows scanning across

Art Unit: 1795

the separation bed width, at various locations along its length (Equipment and Data Acquisition section, p. 2860). This, coupled with the suggestion of RAYMOND for a fraction collector (second paragraph, Silicon Devices section, p. 2860) would have made it obvious to a skilled artisan to utilize the detection unit to detect migration of separated components through any or all of the outlet channels because ideally the separated components will reside in a particular outlet channel of the fraction collector.

Regarding claim 68, RAYMOND teaches a free flow electrophoresis method of separating charged components, the method comprising the steps of:

providing a free flow electrophoresis microchip, comprising:

a separation chamber in which charged components are in use separated (separation bed, Figure 3);

a plurality of separation medium inlet channels having outlets fluidly connected to one inlet side of the separation chamber (1 and 2, Figure 2; left carrier inlet and right carrier inlet, Figure 3) through which flows of a separation medium are in use introduced into the separation chamber such as to develop a laminar flow (second paragraph, Silicon Device section, p. 2860) having a flow direction through the separation chamber (carrier flow indication, Figure 1);

a sample inlet channel having an outlet fluidly connected to the inlet side of the separation chamber (3, Figure 2; sample inlet, Figure 3) through which a flow of sample containing charged components is in use introduced into the

separation chamber (first paragraph, Amino Acid Separation section, p. 2863; Figure 1); and

RAYMOND suggests a plurality of outlet channels having inlets fluidly connected to another outlet side of the separation chamber opposite the inlet side thereof (second paragraph, Silicon Device section, p. 2860), although this design was not utilized in the described invention to simplify fabrication of the initial device.

RAYMOND does not teach a magnetic field unit.

However, OAKEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058]).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKEY, paragraph [0047]).

RAYMOND also teaches supplying flows of sample and separation medium through the respective ones of the sample inlet channel and the separation medium inlet channels and into the separation chamber (fifth sentence, Equipment and Data Acquisition section, p. 2860), wherein the flow of separation medium would inherently act with the magnetic field as taught by

Art Unit: 1795

Oakey to induce an electric field across the separation chamber in a direction substantially orthogonal to the flow direction, where the inherent phenomena would act to deflect the charged components laterally across the separation chamber in dependence upon the charge of the charged components.

Regarding claim 69, RAYMOND teaches outlets of the separation medium inlet channels are disposed in a spaced relation along the inlet side of the separation chamber (Figure 3).

Regarding claim 70, RAYMOND teaches the outlet of the sample inlet channel is disposed in a central region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 71, RAYMOND teaches the outlet of the sample inlet channel is disposed in an end region of the inlet side of the separation chamber (Figures 2 and 3).

Regarding claim 72, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels face in the same direction (Figures 2 and 3).

Regarding claim 73, RAYMOND teaches the separation medium inlet channels are commonly fluidly connected (Figure 2).

Regarding claim 74, RAYMOND teaches groups of ones of the separation medium inlet channels are commonly fluidly connected (Figure 3).

Regarding claim 75, RAYMOND teaches the separation medium inlet channels are separately fluidly connected (Figure 3).

Regarding claim 76, RAYMOND teaches that the supplying sample and separation medium comprises the step of:

delivering sample and separation medium flow through the respective ones of sample inlet channel and separation medium inlet channels and into the separation chamber (as indicated by Sample Inlet and Carrier Flow, Figure 1).

Regarding claim 77, RAYMOND teaches the flow rates of the sample and separation medium are regulated (Figure caption 6 and Figure 7), which affects the residence time of the sample in the separation chamber, which will in turn determine the length of time the sample is subject to the fields and this will control the lateral deflection of the sample charged components.

Art Unit: 1795

Regarding claim 78, RAYMOND teaches the outlets of the sample inlet channel and the separation medium inlet channels are disposed in opposed relation to the inlets of the outlet channels (Figure 2).

Regarding claim 79, RAYMOND suggests the inlets of the outlet channels have a depth at least as great as that of the separation chamber, in that the proposed outlet array is identical to the inlet channel array (second paragraph, Silicon Devices section, p. 2860) and the inlet channel array is shown to have a depth at least as great as that of the separation chamber (Figure 3).

Regarding claim 80, RAYMOND teaches the inlets of the outlet channels are disposed in a spaced relation along the outlet side of the separation chamber (Figure 2).

Regarding claim 81, RAYMOND teaches the inlets of the outlet channels are equally spaced (Figure 2).

Regarding claim 82, RAYMOND teaches the separation chamber comprises a planar chamber (Figure 3) having a planar region (separation bed, Figure 3).

Regarding claim 83, RAYMOND does not teach a magnetic field.

However, OAKEY discloses a microfluidic device, wherein is taught a magnetic field unit for providing a magnetic field substantially orthogonal to the flow direction of a separation medium in a microfluidic format (92, Figure 3; paragraph [0058], wherein the magnetic field is directed substantially orthogonally to a planar region of a microchannel (44 and 92, Figure 3).

At the time of the present invention, it would have been obvious to one of ordinary skill in the art to modify the device as described by RAYMOND with the addition of the magnetic field unit as taught by OAKEY because it would allow use of surface charge to be observed for distinguishing a particular particle in a sample (OAKEY, paragraph [0047]).

Regarding claim 84, RAYMOND teaches the separation chamber has a depth of 50 μm (first paragraph, Silicon Devices section, p. 2859).

Regarding claims 85-87, RAYMOND, as modified by OAKEY in claim 1, teaches a magnetic field unit that is a field generator (OAKEY, paragraph [0058]). Neither RAYMOND nor OAKEY teach the magnetic field unit is a magnet in the form of a Ni-Fe permalloy magnet, which is a well-known magnetic material.

However, at the time of the present invention, it would have been obvious to one of ordinary skill in the art to substitute a known element in the field generator, as taught by OAKEY, as the magnetic field unit for another known

Art Unit: 1795

element, a Ni-Fe permalloy magnet, with a predictable result (*KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, 82 USPQ2d 1385 (2007)).

Regarding claim 88, RAYMOND teaches the microchip further comprising: first and second electrode units (third paragraph, Silicon Devices section, p. 2860) disposed at respective ones of other lateral sides of the separation chamber (8 and 9, Figure 2).

Regarding claim 89, RAYMOND teaches the electrode units each comprise an electrolyte reservoir disposed adjacent the respective lateral side of the separation chamber (8 and 9, Figure 2; side beds, Figure 3) for containing a volume of an electrolyte medium, by virtue of having their own inlets (4 and 5, Figure 2) and outlets (6 and 7, Figure 2), and a plurality of connection channels fluidly connecting the electrolyte reservoir to the respective lateral side of the separation channel (side channel arrays, Figure 3).

Regarding claim 90, RAYMOND teaches each electrolyte reservoir has substantially the same length as the separation chamber (Figure 2).

Regarding claim 91, RAYMOND teaches the connection channels are disposed in a spaced relation along the respective lateral sides of the separation channel (Figure 3).

Regarding claim 92, RAYMOND teaches the connection channels are equally spaced (Figure 3).

Regarding claim 93, RAYMOND teaches the connection channels are 12 μm wide (first paragraph, Silicon Devices section, p. 2859-2860). RAYMOND does not explicitly teach the connection channels have a width from about 1 μm to about 5 μm . However, it has been held where the only difference between the prior art and the claims was a recitation of relative dimensions of the claimed device and a device having the claimed relative dimensions would not perform differently than the prior art device, the claimed device was not patentably distinct from the prior art device (*Gardner v. TEC Systems, Inc.*, 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), *cert. denied*, 469 U.S. 830, 225 USPQ 232 (1984)). Therefore, it would be obvious to one of skill in the art, given the width taught by RAYMOND to utilize a width in the range from about 1 μm to about 5 μm as it is merely a simple change in dimension that would not perform a different function as the width explicitly taught by RAYMOND.

Regarding claim 94, RAYMOND teaches the electrode unit each further comprises an electrode element disposed in the respective electrolyte reservoir (third paragraph, Silicon Devices section, p. 2860).

Art Unit: 1795

Regarding claims 95 and 96, RAYMOND suggested a plurality of collection units fluidly connected to respective ones of the outlet channels for collection of a plurality of separated components, suggesting a fraction collector (second paragraph, Silicon Devices section, p. 2860).

Regarding claim 97, RAYMOND teaches a detection unit (Detection System section, p. 2860) for detecting migration of at least one separated component through at least one of the outlet channels (inset Figure 8 and Figure 9).

Regarding claims 98 and 99, RAYMOND teaches that the detection system comprises a motorized X-Y translation stage that allows scanning across the separation bed width, at various locations along its length (Equipment and Data Acquisition section, p. 2860). This, coupled with the suggestion of RAYMOND for a fraction collector (second paragraph, Silicon Devices section, p. 2860) would have made it obvious to a skilled artisan to utilize the detection unit to detect migration of separated components through any or all of the outlet channels because ideally the separated components will reside in a particular outlet channel of the fraction collector.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. CHRISTOPHER BALL whose telephone number is (571)270-5119. The examiner can normally be reached on Monday through Thursday, 9 am to 5 pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Nam X Nguyen/
Supervisory Patent Examiner, Art Unit 1753

JCB
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